Knowledge-based computer-aided decision support in prenatal toxoplasmosis screening (TempToxopert)

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Abstract: The development of TempToxopert aimed at assisting clinicians in analysing the results of prenatal toxoplasmosis screening tests. Expert knowledge about diagnostics, screening strategies, and treatment of toxoplasmosis during pregnancy was collected and represented as a rule-based decision graph. Based on actual and past individual findings, the system generates case-specific interpretative reports consisting of a diagnostic hypothesis, recommendations for further treatment, and interpretations of specific test results.

Objectives: Maternal primary infection with Toxoplasma gondii acquired during pregnancy can result in connate toxoplasmosis, a critical medical condition for the unborn. As a preventive measure, systematic serological screening (i.e., consecutive measurements of immunglobuline titers during pregnancy) was established in most European countries in the late 70ies. Because of physiological variability, actual courses of titers may vary considerably from patient to patient and the interpretation of more complex patterns can be difficult and error-prone. TempToxopert was developed to facilitate routine laboratory work, but also to assure highest quality standards in patient management.

Methods: Expert knowledge about diagnostics, screening strategies, and treatment of toxoplasmosis during pregnancy was collected and represented as a rule-based decision graph. The system processes results of serological (Sabin Feldman Dye Test, IgM-ISAGA, and IgG avidity) and prenatal diagnostic tests (polymerase chain reaction testing of amniotic fluid) carried out during screening. It automatically generates patient-specific interpretative reports consisting of a diagnostic hypothesis, recommendations for further treatment, and explanations of the test results.

Results: The decision graph comprises 73 states connected with 636 transitions (diagnostic rules) and uses 1 009 (therapeutic and explanatory) rules and 205 text modules for generating of the interpretative reports. In a retrospective study with data of 14 944 pregnant women comparison of TempToxopert and clinician's final interpretations yielded diagnostic accuracy rate of over 99.7%.

Conclusion: TempToxopert proved to be capable to assist and standardize laboratory work by automated interpretation of toxoplasmosis-screening test results in a large retrospective study and routine practical application. The system is available on the web at http://medexpert.imc.akh-wien.ac.at:8080/temptoxoWWW.

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